

Characteristics of an eye-safe Kiloherz instrument

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NASA's Next Generation SLR system has conducted satellite measurements in two tracking modes. Two-way, single station returns have been received from satellites up to LAGEOS altitude with a conventional SLR configuration using the 2 kHz laser transmitter. These measurements show the characteristics of the target satellite in the single photon regime, and RMS noise levels are limited to a minimum of about 30 mm by the convolution of the transmitter pulse width and the receiver impulse response. The instrument has also taken measurements as the receiver in a two station (3-way) configuration with a nearby high energy system. This configuration can be used for receiver testing and the higher power of the 4 or 5 Hz transmitting laser allows easier detection of returns from satellites at GPS and ETALON altitudes. The tighter transmitted pulse yields measurements with an RMS noise level closer to 20 mm. When the receiver stop time of the transmitter is considered as well as the transmit time, the 10 mm RMS noise level of the high energy transmitter can be matched, demonstrating the integrity of the eye-safe system's event timer and processor. The increased number of returns per second from the kilohertz system produces normal points comparable in precision to the higher energy transmitter system and allows the station to autonomously close the tracking loop. Data taken at kilohertz resolution can also be used improve the definition of signals in the returns from satellites such as Ajisai which have a strong satellite signature.